

## A REVIEW OF THE POMACENTRID FISH GENUS *PARMA*, WITH DESCRIPTIONS OF TWO NEW SPECIES

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and

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### ABSTRACT

The damselfish genus *Parma* (family Pomacentridae) is reviewed. The group contains eight species, including two which are described as new. *P. microlepis* and *P. unifasciatus* have overlapping distributions along the coast of New South Wales. *P. oligolepis* and *P. polylepis* are also found in New South Wales, but their range extends into Queensland. The latter species is also found at Lord Howe Island, Norfolk Island, and New Caledonia. *P. victoriae* occurs along the southern coast of Australia, including Tasmania. The known distribution of *P. mccullochi* extends from approximately Esperance, Western Australia to the Abrolhos Islands. *P. alboscapularis*, new species, is described from nine specimens collected at Lord Howe Island, North Island, New Zealand, and the Kermadec Islands. It is separable from other members of the genus by a combination of features which include scales on the inferior limb of the preopercle, a continuous exposed margin on the lower edge of the preorbital and suborbital bones, 25 to 32 tubed lateral-line scales, a convex snout profile, and 36 to 41 vertical scale rows. *P. occidentalis*, new species is described from 29 specimens collected off the west coast of Western Australia. It is distinguishable on the basis of a combination of characters which are similar to those given above for *P. alboscapularis* except it has 32 to 35 lateral-line scales, a distinctly concave snout profile, and 43 to 46 vertical scale rows.

### INTRODUCTION

The genus *Parma* Günther (1862) contains eight species which are confined mainly to the Australian-New Zealand region. These fishes and the

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monotypic *Hypsypops* Gill (1861) from southern California and Mexico share the distinction of being the only pomacentrid genera which are mainly confined to temperate and subtropical latitudes. The family Pomacentridae constitutes one of the largest groups of coral reef fishes, containing approximately 250 species, most of which inhabit the Indo-W. Pacific region.

The genus has not been reviewed previously on a comprehensive basis. The most important works are those of Günther (1862), who described the genus, and Whitley (1929a). The former author recognized four species, *microlepis*, *squamipinnis* (a synonym of *microlepis*), *polylepis*, and *rubicunda* (now placed in *Hypsypops*). Whitley included five species of *Parma* in his review of the Australian 'Amphiprioniformes': *mccullochi*, *microlepis*, *oligolepis*, *unifasciatus*, and *viola*. The last named species is a junior synonym of *P. victoriae*, which Whitley placed in a separate genus, *Actinochromis* Bleeker (1877). In addition to the species treated by Whitley the present review includes Günther's *polylepis* and two new species, *P. occidentalis* from Western Australia and *P. alboscapularis* from Lord Howe Island, New Zealand, and the Kermadec Islands.

The members of the genus generally inhabit shallow rocky areas, although *P. occidentalis*, *P. microlepis* and *P. unifasciatus* are known to occur at depths of at least 35 metres. The diet consists primarily of algae.

Four of the species, *P. microlepis*, *P. oligolepis*, *P. polylepis*, and *P. unifasciatus*, have overlapping distributions in New South Wales. The south coast of Queensland is inhabited by *P. oligolepis* and *P. polylepis*. The latter species also occurs at Lord Howe Island with *P. alboscapularis*, which is the sole representative of the genus in New Zealand and the Kermadec Islands. *P. victoriae* is widespread across the south coast of Australia, including Tasmania. *P. occidentalis* inhabits the central west coast of Western Australia while *P. mccullochi* frequents the southwest corner from approximately the Abrolhos Islands to the Recherche Archipelago off Esperance, Western Australia. *P. victoriae*, *P. occidentalis*, and *P. mccullochi* are sympatric in the central west coast although the range of *victoriae* does not appear to extend much further north than Cape Naturaliste.

*P. oligolepis*, *P. polylepis*, *P. mccullochi* and *P. occidentalis* are sometimes found on coral reefs. The former species has been taken as far north as Green Island off Cairns. *P. polylepis* is not uncommon on the outer reef edge at One Tree Island in the Capricorn Group of the Great Barrier Reef. This species also occurs at New Caledonia, Norfolk Island, and Lord Howe Island, where it is extremely common.

## METHODS OF COUNTING AND MEASURING

The methods of counting and measuring are the same as those described by Allen (1972), except the length of the dorsal and anal spines are

measured proximally from the base of the spine rather than the point at which the spine emerges from the scaly sheath. Measurements were made with needlepoint dial calipers to the nearest one-tenth millimetre. Standard length is abbreviated as SL. The fraction  $\frac{1}{2}$  which appears in the dorsal and anal fin ray formulae refers to a bifurcate condition of the last ray.

The counts and proportions which appear in parentheses under the description section for each species apply to the paratypes when differing from the holotype. A summary of counts for the dorsal, anal, and pectoral fin rays, tubed lateral-line scales, and gill rakers on the first arch is presented in Tables 1 and 2.

Type specimens of *P. alboscapularis* and *P. occidentalis* have been deposited at the Australian Museum, Sydney (AM); Canterbury Museum, New Zealand (CM); CSIRO, Division of Fisheries and Oceanography, Cronulla, Australia (CSIRO); National Museum of New Zealand, Wellington (NMNZ); Queensland Museum, Brisbane (QM); and the Western Australian Museum, Perth (WAM).

## TAXONOMY

### GENUS *PARMA* GÜNTHER

*Parma* Gunther, 1862. Cat. Fish Brit. Mus., vol. 4, p. 57 (type species *Parma microlepis* by subsequent designation of Jordan, 1919).

*Actinochromis* Bleeker, 1877. Natuurk. Verh. Holl. Maatsch. Wetensch. (3) ii, 6, p. 6 (type species, *Glyphidodon victoriae* by original designation).

#### Diagnosis

Dorsal rays XIII, 16 to 21; anal rays II,  $13\frac{1}{2}$  to  $16\frac{1}{2}$ ; pectoral rays 19 to 22; tubed lateral-line scales 21 to 35; gill rakers 7 to  $13 + 1 + 9$  to 12; teeth uniserial, close-set and slender, about 40 to 62 in each jaw; margin of pre-orbital, suborbital, and bones of opercular series entire; preorbital naked or scaled on posterior section; suborbital scaled.

Body depth 1.6 to 2.0, head length 3.0 to 4.3, both in standard length. Snout 2.3 to 3.4, eye 3.0 to 4.6, interorbital 2.3 to 3.6, depth of caudal peduncle 1.7 to 2.1, length of caudal peduncle 3.0 to 5.3, of pectoral fin 0.9 to 1.1, of pelvic fin 0.7 to 1.1, caudal concavity 1.4 to 3.4, all in head length.

Colour in alcohol generally brown, some species with one or more pale bars on sides. Juveniles usually pale (yellow in life) with pattern of dark stripes antero-dorsally and scattered spots on head and body (these markings bright blue in life). Juveniles also possess an ocellus on the dorsal fin.

## Remarks

*Parma* is the largest pomacentrid genus of temperate Australia. Its salient features include a relatively large size at maturity, deep body, uniserial teeth, relatively small scales, and a benthic-dwelling mode (as opposed to the members of the genus *Chromis*, whose New Zealand and temperate Australian representatives are mid-water foragers). The members of this genus bear a close resemblance to the monotypic *Hypsypops rubicunda*, from southern California and the Pacific coast of Mexico. However, *Hypsypops* is characterized by 12 dorsal spines, slightly larger scales, and adults exhibit a prominent hump on the forehead and interorbital region. It is possible that *Parma* and *Hypsypops* have evolved from a common ancestral stock which was once widespread or their similarity may be the result of convergence due to environmental similarities.

## KEY

- |     |   |                  |   |
|-----|---|------------------|---|
| 1a. | Inferior limb of preopercle naked, vertical scale rows from upper edge of gill opening to base of caudal fin 30 to 38; tubed lateral-line scales 21 to 28   | ... ..           | 2 |
| 1b. | Inferior limb of preopercle scaled; vertical scale rows from upper edge of gill opening to base of caudal fin 36 to 46; tubed lateral-line scales 25 to 35  | ... ..           | 5 |
| 2a. | Preopercle largely naked, scales covering about ½ total area, arranged in 3-4 transverse rows below suborbital; snout profile convex; predorsal scales extending to about anterior margin of eye; preorbital naked; tubed lateral-line scales 21 to 22 (Victoria; Tasmania; South Australia; Western Australia) | ... .. victoriae |   |
| 2b. | Preopercle mostly scaled, scales covering more than ½ total area, arranged in 6-7 transverse rows; snout profile concave or more or less straight; predorsal scales extending to level of posterior nostrils; preorbital scaled on posterior section; tubed lateral-line scales 22 to 28                        | ... ..           | 3 |
| 3a. | Lower margin of preorbital only slightly produced, not forming triangular projection; scale rows between lateral-line and first dorsal spine 5 to 6; upper corner of operculum  |                  |   |

- frequently with white patch (New South Wales) ... .. *microlepis*
- 3b. Lower margin of preorbital distinctly triangular; scale rows between lateral-line and first dorsal spine 4; upper corner of operculum without white patch ... .. 4
- 4a. Lower margin of preorbital with notch in front of triangular projection; soft dorsal rays usually 19 or 19½; surface of preorbital smooth without bony ridges; whitish bar on middle of sides absent (Queensland; New South Wales) ... .. *oligolepis*
- 4b. Lower margin of preorbital without notch in front of triangular projection; soft dorsal rays usually 17½; surface of preorbital with bony ridges, at least in adults; whitish bar on middle of sides (New South Wales) ... .. *unifasciatus*
- 5a. Lower margin of preorbital and suborbital discontinuous, separated by patch of scales (not apparent without magnification in specimens under about 90 mm SL); specimens in excess of about 100 mm SL with bony knobs above anterior corner of eye and at mid-interorbital, becoming more noticeable with increased size; specimens under about 125 mm SL with two pale bars on sides, frequently with large ocellus at soft dorsal junction (New South Wales; S. Queensland; Lord Howe Island; Norfolk Island; New Caledonia) ... .. *polylepis*
- 5b. Lower margin of preorbital and suborbital continuous, not separated by patch of scales; specimens of all sizes without bony knobs above eye and at mid-interorbital; specimens of all sizes without pale bars on sides, ocellus present in juveniles under about 50 mm SL ... .. 6
- 6a. Tubed lateral-line scales usually 32 to 35; occipital slightly arched; snout profile distinctly concave; predorsal scales extending to about anterior margin of eye; vertical scale rows from upper edge of gill opening to base of caudal fin 43 to 46; head and body usually light brown in preservative, frequently

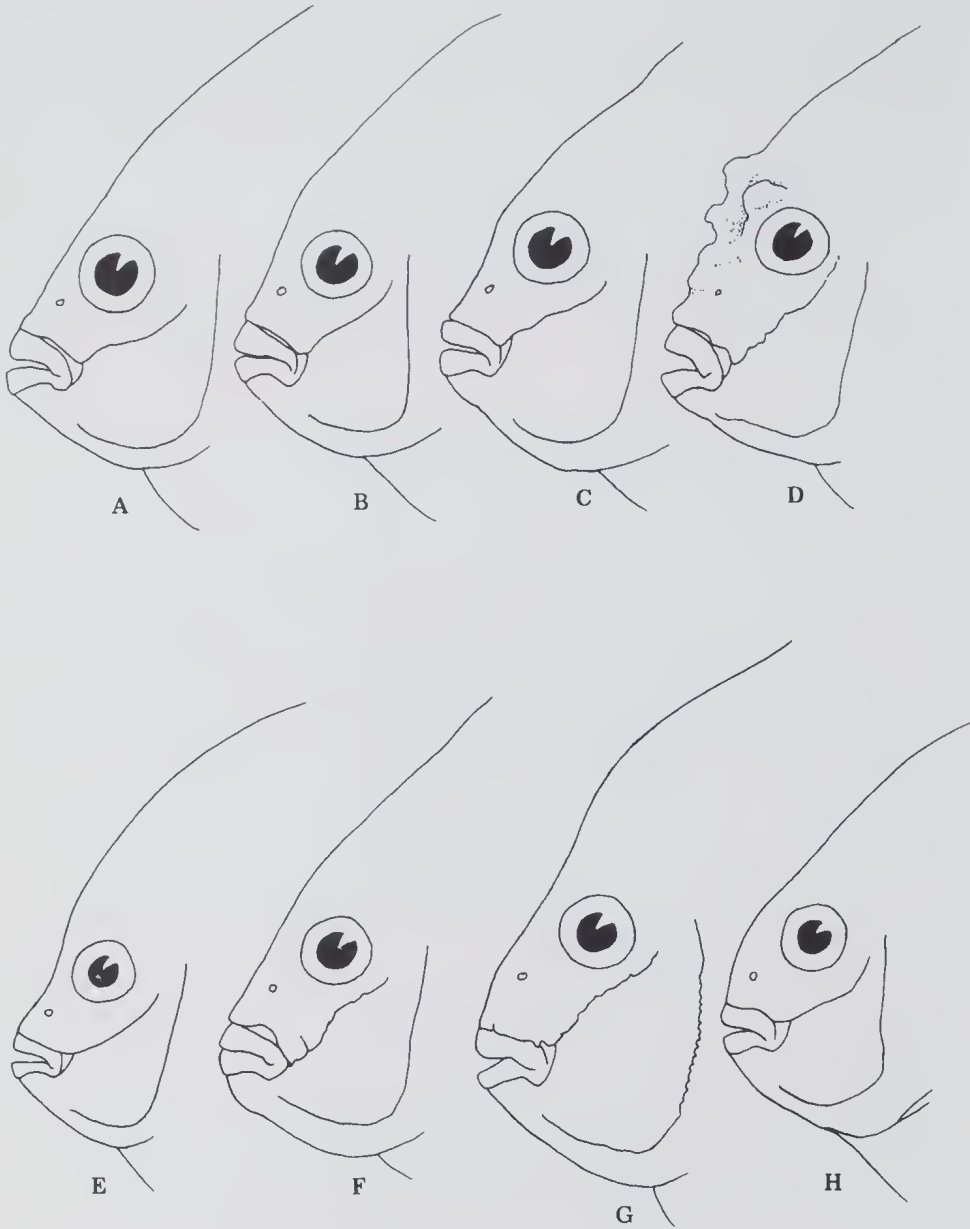


Fig. 1. Head profiles of various *Parma* (*P. mccullochi* not shown): (A) *microlepis*; (B) *unifasciatus*; (C) *polylepis*, juvenile to small adult; (D) *polylepis*, large adult; (E) *occidentalis*; (F) *oligolepis*; (G) *alboscapularis*; (H) *victoriae*.

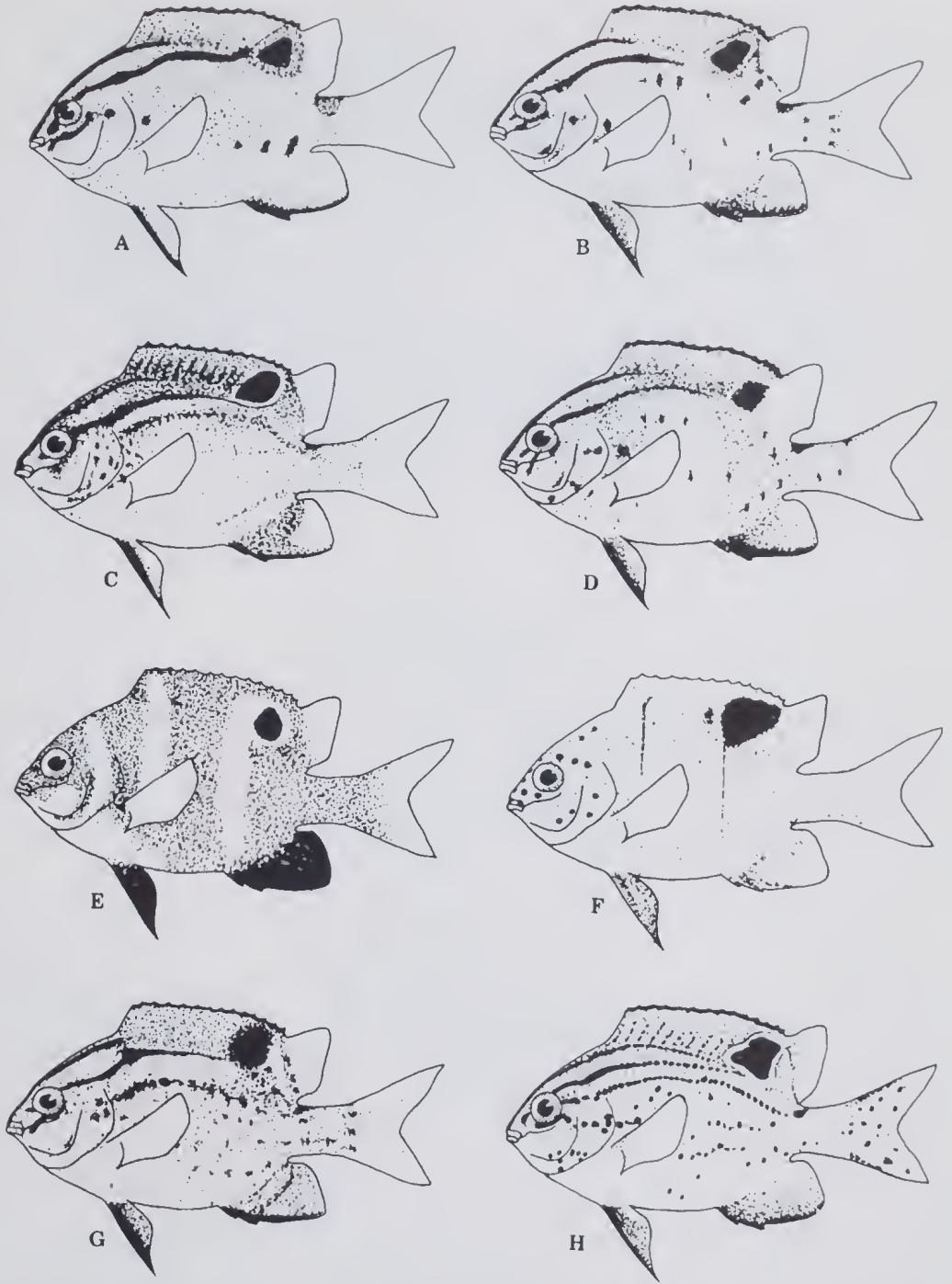


Fig. 2. Juvenile colour patterns of *Parma*: (A) *victoriae*; (B) *microlepis*; (C) *oligolepis*; (D) *unifasciatus*; (E) *polylepis*; (F) *occidentalis*; (G) *alboscapularis*; (H) *mccullochi*.

- with pair of faint dusky bars on sides (Western Australia) ... .. *occidentalis* n. sp.
- 6b. Tubed lateral-line scales 25 to 32; occipital not arched, confluent with contour of head profile; snout profile convex; predorsal scales extending to level of nostrils; vertical scale rows from upper edge of gill opening to base of caudal fin 36 to 41; head and body entirely dark brown in preservative ... .. 7
- 7a. Surface of preorbital with bony tubercles or ridges, at least in adults; pectoral rays usually 22, occasionally 21 (Lord Howe Island; New Zealand; Kermadec Islands) ... .. *alboscapularis* n. sp.
- 7b. Surface of preorbital without bony tubercles; pectoral rays usually 21, occasionally 20 (Western Australia) ... .. *mccullochi*

*Parma victoriae*

(Figs. 1H, 2A, 3 and 4; Tables 1, 2 and 3)

*Glyphidodon victoriae* Günther, 1863. Ann. Mag. Nat. Hist., vol. 11 (3), p. 115 (type locality, Victoria).

*Heliastes lividus* Klunzinger, 1872. Arch. Naturg. (Wiegmann), vol. 38, 1, p. 36 (type locality, Port Phillip, Victoria).

*Parma viola* Whitley, 1929a. Mem. Queensland Mus., vol. 9 (part 3), p. 231 (type locality, Tasmania).

Diagnosis

Dorsal rays XIII, 16½ to 17½; anal rays II, 15 to 16; pectoral rays 19 to 21; tubed lateral-line scales 21 to 22; gill rakers 9 to 11 + 1 + 10 or 11 (total 21 to 23); upper and lower jaw each with 44 to 50 teeth; body depth 1.8 to 1.9 in standard length; head length 3.0 to 3.3 in standard length; snout 3.0 to 3.4, eye 3.5 to 4.5, interorbital 2.6 to 2.9, depth of caudal peduncle 1.8 to 2.0, length of caudal peduncle 3.0 to 3.5, of pectoral fin 0.9 to 1.0, of pelvic fin 0.9 to 1.1, caudal concavity 1.7 to 2.2, all in head length.

Colour in alcohol: head and body mottled brown, lighter on breast, abdomen, and underside of head; snout and forehead dark brown and dark pigment usually present on middle section of upper lip; fins dark brown to blackish except pectorals dusky; dark wedge-shaped mark on upper portion of pectoral base. Two subadults, 64.5 and 75.8 mm SL, are light brown



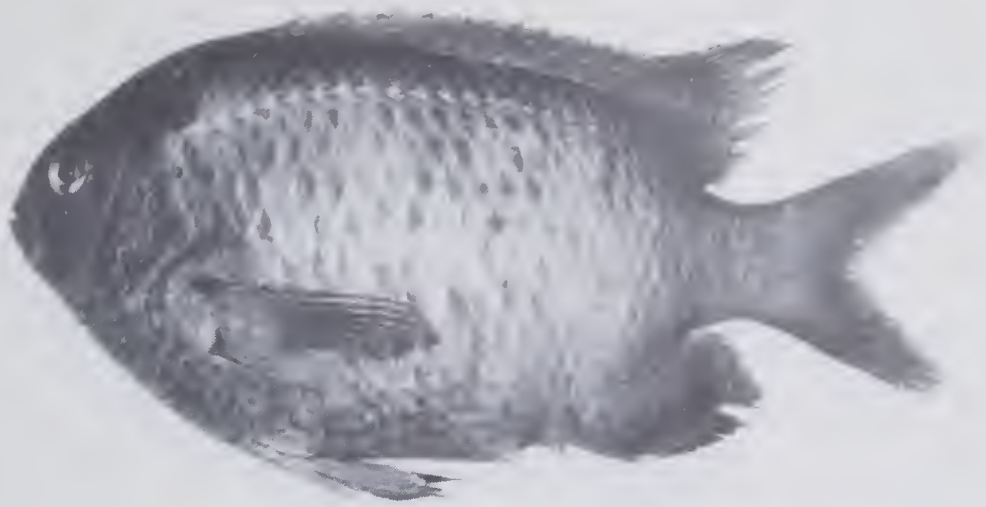


Fig. 3. *Parma victoriae*, 140 mm SL, Moana, South Australia.

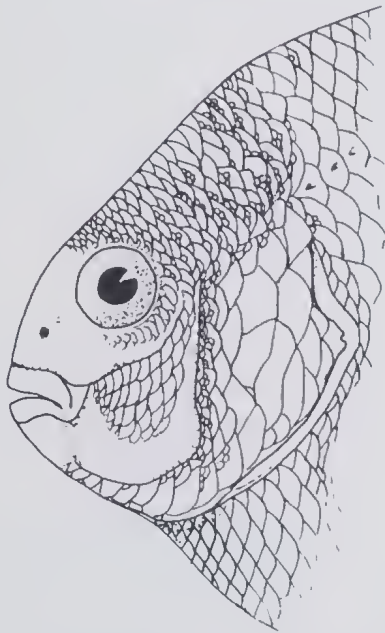


Fig. 4. Head of *Parma victoriae*.

grading to dark brown dorsally; fins dusky to dark brown, with posterior portion of soft dorsal, anal, and caudal more or less translucent, especially in smaller specimen; large pale-ringed black ocellus at base of dorsal fin

between 11th spine and first few soft rays, more prominent on smaller specimen.

Colour in life (based on a kodachrome transparency of a freshly collected specimen): body mostly yellowish-brown with irregular mottlings of darker brown; head and area above lateral-line dark brown; fins brown to dusky. The colours of a small juvenile (approximately 25 mm TL) taken from a colour transparency which was sent to us by Mr A.B. Whittenbury are as follows: head and body mostly yellow, although slightly brownish dorsally; three neon-blue lines on head and anterior portion of back, the first extending from snout tip to dorsal origin, the second from upper edge of eye to dorsal ocellus, the third from chin to posterior edge of preopercle; neon-blue spot about size of pupil on upper edge of caudal peduncle, just behind last dorsal ray and three smaller blue spots above anal fin base; dorsal fin yellowish-brown with large blue-edged black ocellus at soft dorsal junction; edge of spinous dorsal with narrow blue margin; remainder of fins yellow to translucent; except anteriormost pelvic ray darkened.

#### Remarks

The holotype is deposited at the British Museum (Natural History).

#### Material examined

Nine specimens, 64.5-178.5 mm SL.

Tasmania — AM I.6611 (holotype of *Parma viola*), 167.0 mm.

Victoria — AM I.16980-013, 2 specimens, 75.8 and 134.0 mm, Bell's Beach; AM I.16982-005, 64.5 mm, Bell's Beach.

South Australia — AM I.17608-002, 2 specimens, 124.0-138.2 mm, Moana Reef.

Western Australia — WAM P25128-001, 3 specimens, 162.5-178.5 mm, Geopraphe Bay.

#### *Parma microlepis*

(Figs. 1A, 2B, 5 and 6; Tables 1, 2 and 3)

*Parma microlepis* Günther, 1862. Cat. Fish Brit. Mus., vol. 4, p. 57 (type locality, Port Jackson, New South Wales).

*Parma squamipinnis* Günther, 1862. *Ibid.*, p. 58 (type locality, Australia).

*Glyphidodon (Parma) australis* Steindachner, 1867. Sitz. Akad. Wiss, Wien, vol. lvi, p. 328 (no locality given).



Fig. 5. *Parma microlepis*, adult (from Waite, 1905).

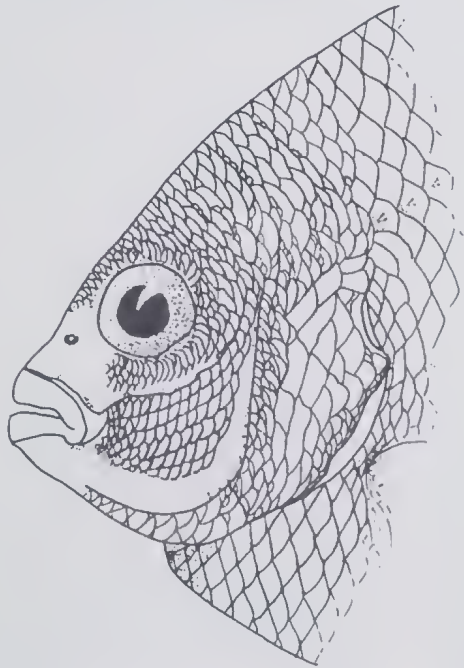


Fig. 6. Head of *Parma microlepis*.

## Diagnosis

Dorsal rays XIII, 16 to 18½; anal rays II, 14½ to 16½; pectoral rays 20 to 21; tubed lateral-line scales 23 to 28; gill rakers 8 to 11 + 1 + 10 or 11 (total 19 to 23); upper and lower jaw each with 46 to 54 teeth; body depth 1.8 to 2.0, head length 3.0 to 3.2, both in standard length; snout 3.1 to 3.4, eye 3.4 to 4.1, interorbital 3.0 to 3.6, depth of caudal peduncle 2.0 to 2.1, length of caudal peduncle 3.7 to 4.8, of pectoral fin 1.0 to 1.1, of pelvic fin 0.9 to 1.0, caudal concavity 1.8 to 2.1, all in head length.

Colour in alcohol: head and body dark brown; frequently a darker band across snout connecting orbits and another across chin extending onto lower edge of preopercle; lips, preorbital, anterior suborbitals, and anterior portion of interopercle tan; large white blotch on upper edge of opercle margin; fins dark brown to blackish except pectorals dusky.

Juveniles between about 15-30 mm SL exhibit the following pattern: head and body mostly tan; three bluish stripes on head and anterior portion of back, the first extending from tip of snout to dorsal origin, the second from eye to dorsal ocellus, and the third from corner of mouth to about middle of opercle; small dark specks scattered on body and bluish saddle on dorsal edge of caudal peduncle behind last dorsal ray; spinous dorsal fin dusky with narrow black margin, soft dorsal pale; pale-rimmed black ocellus between 11th dorsal spine and 2nd soft ray; anal fin mostly pale with blackish anterior margin; caudal slightly dusky; pelvics dusky; pectorals pale.

Juveniles begin to turn brown between about 30-40 mm SL. The small dark specks on the sides are no longer apparent in specimens larger than about 55 mm SL. The prominent white spot or 'ear' mark on the opercle becomes readily apparent at about this same size. The dorsal ocellus is generally retained until a standard length of about 80-90 mm.

## Remarks

Specimens from Sydney Harbour frequently lack the characteristic white 'ear' patch.

The holotype is deposited at the British Museum (Natural History).

## Material examined

140 specimens, 17.0-138.8 mm SL.

New South Wales — AM IA.554-65, 12 specimens, 53.3-138.8 mm, Bondi Beach (plus 22 additional lots from the Sydney area [including Long Reef, Sydney Harbour, Maroubra, and Botany Bay] containing 71 specimens, 17.0-136.7 mm); AM IB.468, 36.0 mm, Clarence River; AM IB.2516, 114.0 mm, Byron Bay; AM I.11247, 104.0 mm, Baranju Head; AM I.15912-012, 13 specimens, 74.2-116.3 mm, Jervis Bay (plus 6 additional lots from this locality containing 26 specimens 46.0-104.5 mm); AM I.16467-002, 4 specimens, 34.0-39.0 mm, Minnie Waters; AM I.16468-001, 3 specimens, 35.0-37.0, Minnie Waters; AM I.16970-008, 22.0 mm, Nullica Bay; AM

I.17343-004, 3 specimens, 22.0-37.0 mm, Seal Rock (plus 2 additional lots from this locality containing 2 specimens, 30.0 and 49.0 mm); CSIRO C3475, 103.0 mm, Cronulla; CSIRO C3476, 97.3 mm, Cronulla.

*Parma oligolepis*

(Figs. 1F, 2C, 7 and 8; Tables 1, 2 and 3)

*Parma oligolepis* Whitley, 1929a. Mem. Queensland Mus., vol. 9 (part 3), p. 230 (type locality, Cape Moreton, Queensland).



Fig. 7. *Parma oligolepis*, 106 mm SL, Minnie Waters, New South Wales.

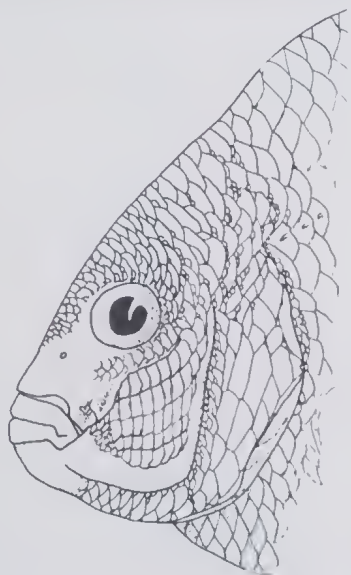


Fig. 8. Head of *Parma oligolepis*.

## Diagnosis

Dorsal rays XIII, 17 to 20; anal rays II, 13½ to 15; pectoral rays 20 to 22; tubed lateral-line scales 22 to 24; gill rakers 9 to 12 + 1 + 11 or 12 (total 21 to 24); upper and lower jaw each with 48 to 56 teeth; body depth 1.6 to 1.9 in standard length; head length 3.0 to 3.3 in standard length; snout 2.7 to 3.0, eye 3.5 to 4.3, interorbital 2.4 to 3.1, depth of caudal peduncle 1.8 to 2.0, length of caudal peduncle 4.0 to 4.2, of pectoral fin 0.9 to 1.0, of pelvic fin 0.8 to 1.0, caudal concavity 1.8 to 2.2, all in head length.

Colour in alcohol: head and body entirely dark brown, except lighter on breast and underside of head; fins dark brown to blackish except more or less translucent on hindmost portion of soft dorsal, anal, and caudal fin; pectorals dusky with dark wedge-shaped mark on upper portion of fin base.

The colour pattern of four juvenile specimens 36.5-46.4 mm SL is as follows: head and body brown, darker dorsally; smaller specimens with pair of bluish lines on head and anterior portion of back, the first extending from snout tip to dorsal origin, the second from eye to dorsal ocellus (these marks still evident in 67.8 mm specimen from Byron Bay, New South Wales); 36.5 mm specimen with scattered dark specks on head, posterior portion of body, and caudal peduncle; 44.0 and 74.0 mm specimens with small blue dot on preorbital and pale line on suborbitals; spinous dorsal and basal 1/3 of soft dorsal brown, prominent pale-rimmed black ocellus between 11th dorsal spine and about first two soft rays; anal and pelvics darker than other fins except anal translucent posteriorly; pectorals pale; caudal dusky.

The live coloration of adults is unknown, but they are probably entirely dark brown. Juveniles are largely yellowish with a blue-rimmed black ocellus, blue lines on the head and upper back, and blue specks on the head and body. The margin of the spinous dorsal and anal fin is also blue.

## Remarks

The holotype is deposited at the Queensland Museum.

## Material examined

19 specimens, 30.0-160.2 mm SL.

Queensland — AM IA.3666 (paratype), 159.3 mm, Green Island, AM IA.3944-5, 2 specimens, 136.5-160.2 mm, Rat Island, Port Curtis; QMI.2536 (holotype), 156.0 mm, Cape Moreton.

New South Wales — AM IB.6838-39, 2 specimens, 44.0-105.0 mm, Minnie Waters; AM I.16466-005, 36.5 mm, Minnie Waters; AM I.16467-021, 4 specimens, 36.8-99.0 mm, Minnie Waters; AM I.16468-012, 4 specimens, 101.5-112.0 mm, Minnie Waters; AM I.17896-001, 2 specimens, 30.0-36.0 mm Long Bay; AM I.17915-001, 2 specimens, 62.8-74.0 mm, Byron Bay.

*Parma unifasciatus*

(Figs. 1B, 2D, 9 and 10; Tables 1, 2 and 3)

*Pomacentrus unifasciatus* Steindachner, 1867. Sitzb. Akad. Wiss. Wien.,  
vol. lvi (1), p. 326 (no locality given).



Fig. 9. *Parma unifasciatus*, 118 mm SL, Long Reef, near Sydney.

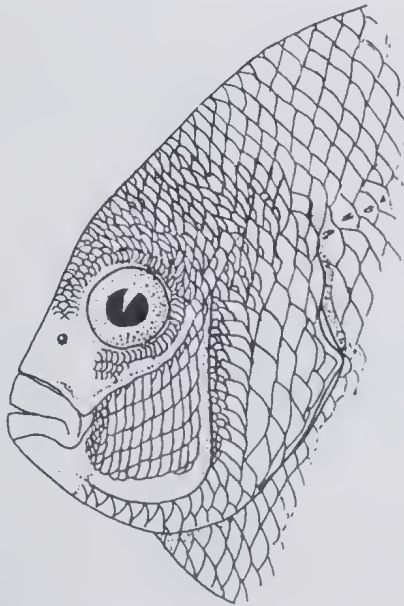


Fig. 10. Head of *Parma unifasciatus*.

## Diagnosis

Dorsal rays XIII, 17 to 19; anal rays II, 14 to 15; pectoral rays 20 to 22; tubed lateral-line scales 22 to 27; gill rakers 9 to 11 + 1 + 10 to 12 (total 20 to 23); upper and lower jaw each with 40 to 46 teeth; body depth 1.7 to 1.9, head length 3.1 to 3.2, both in standard length; snout 2.7 to 2.9, eye 3.4 to 4.0, interorbital 2.8 to 3.0, depth of caudal peduncle 1.9 to 2.0, length of caudal peduncle 3.0 to 3.4, of pectoral fin 0.9 to 1.1, of pelvic fin 0.9 to 1.0, caudal concavity 1.8 to 2.3, all in head length.

Colour in alcohol: head and body mostly dark brown, breast and centre of scales slightly lighter; prominent pale band (3-4 scales wide) extending from base of 8th-10th dorsal spine to abdomen; fins dark brown, except pectorals dusky; lips tan. The coloration of four adults, 158.5-172.0 mm SL, obtained recently at the Sydney Market is slightly different than most of the specimens we examined. They are generally lighter brown with dusky scale margins. Live specimens from Byron Bay exhibit this same coloration. The posterior portion of the body and caudal peduncle are notably pallid. This region is separated from the pale mid-body bar by a darker brown area. The fins of these specimens are nearly blackish.

The colour pattern of two juvenile specimens 35.0 and 36.0 mm SL is as follows: body brown with broad tan area on middle of sides about 6-7 scales wide, extending from lateral-line to abdomen; breast, caudal peduncle and region adjacent to soft dorsal and anal fins tan; dark spot on upper edge of caudal peduncle adjacent to hindmost dorsal ray; several dark specks on caudal peduncle and posterior portion of body; larger dark spot behind upper edge of opercle; lower portion of head tan, upper part, including snout and forehead brown; pair of bluish lines on head and anterior portion of back, the first extending from snout tip to dorsal origin, the second passing through eye to dorsal ocellus, although indistinct and broken posteriorly; short bluish streak below antero-ventral corner of eye extending towards rictus; small bluish spot on side of snout, just in front of eye; opercle with 3-4 dark blotches; spinous dorsal dusky with narrow black margin, soft dorsal tan to translucent; large pale-rimmed black ocellus between 11th dorsal spine and about first two soft rays; anal and pelvic fins mostly tan except dusky on anterior margin; caudal and pectorals pale. The characteristic juvenile ocellus gradually fades with growth. It is generally absent in specimens over 80-90 mm SL, although we have examined one specimen, 52.5 mm, which does not have the ocellus and exhibits the adult pattern.

The colours of a freshly collected adult taken from a kodachrome transparency are as follows: head, body, and fins mostly dark brown; edge of opercle and outer 1/3 of pectorals pale brown; prominent pale brown band, about six scales wide, extending from base of 8th-10th dorsal spine to abdomen.



## Remarks

This species is extremely common at Byron Bay, New South Wales, which is located near the Queensland border. The depth distribution ranges from three to at least 23 metres.

## Material examined

Twenty six specimens, 31.9-172.0 mm SL.

New South Wales — AM IA.553, 138.8 mm, Bondi Beach; AM IA.4880, 120.0 mm, Port Jackson; AM IB.1356, 127.0 mm, Dee Why; AM IB.2341, 144.8 mm, Newcastle; AM IB.6837, 78.0 mm, Minnie Waters; AM IB.7349, 102.3 mm, Quarantine Beach, Sydney Harbour; AM I.6848, 142.0 mm, Maroubra; AM I.15575-006, 48.2 mm, Woolongong; AM I.15892-002, 2 specimens, 101.0-108.0 mm, Long Reef; AM I.16237-008, 108.5 mm, Long Reef, AM I.16466-009, 35.0 mm, Minnie Waters; AM I.16467-007, 4 specimens, 31.0-43.0 mm, Minnie Waters; AM I.16468-004, 2 specimens, 35.2-35.6 mm, Minnie Waters; AM I.17108-005, 3 specimens, 51.3-53.3 mm, Long Bay, AM I.17332-004, 114.7 mm, Long Reef; AM I.17903-001, 4 specimens, 158.5-172.0 mm, Sydney Market.

## *Parma polylepis*

(Figs. 1C and D, 2E, 11 and 12; Tables, 1, 2 and 3)

*Parma polylepis* Günther, 1862. Cat. Fish Brit. Mus., vol. 4, p. 59 (type locality, Norfolk Island).

## Diagnosis

Dorsal rays XIII, 16½ to 19; anal rays II, 13½ to 14½; pectoral rays 20 to 22; tubed lateral-line scales 26 to 33; gill rakers 7 to 11 + 1 + 9 to 11 (total 17 to 23); upper and lower jaw each with 44 to 48 teeth; body depth 1.6 to 1.7, head length 3.2 to 3.4, both in standard length; snout 2.5 to 2.7, eye 3.2 to 4.1, interorbital 2.3 to 2.8, depth of caudal peduncle 1.7 to 1.9, length of caudal peduncle 3.3 to 4.0, of pectoral fin 0.9, of pelvic fin 0.8 to 0.9, caudal concavity 1.8 to 2.3, all in head length.

Colour in alcohol: head and body dark brown, scale centres lighter especially on opercle and anterior half of body; upper limb of preopercle and opercle with dark brown outline; fins dark brown to blackish, except pectorals dusky with dark region at base especially prominent on upper and lowermost portion.

The colour pattern of juveniles between about 25-80 mm is as follows: two prominent pale bars on sides, each about six scales wide, the first extending from base of first 3-4 dorsal spines to just behind and below pectoral base, the second from base of 9th-11th dorsal spines to anal fin origin; caudal peduncle, breast, and lower half of head tannish; hind margin of preopercle and adjacent portion of opercle with dark brown streak,



Fig. 11. *Parma polylepis*, 195 mm SL, Lord Howe Island.

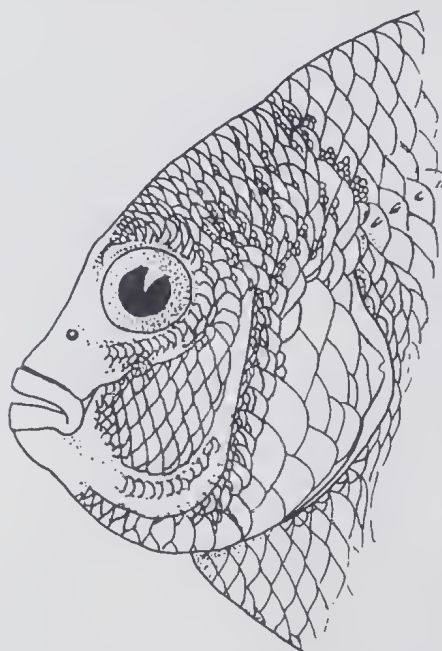


Fig. 12. Head of *Parma polylepis*.

similar mark on upper edge of opercle; indistinct pale band on nape, extending ventrally to lower edge of opercle; spinous dorsal fin brown to dusky, except where interrupted by extensions of pale bars on sides; soft dorsal dark brown on basal 1/3, translucent distally; pale-rimmed black ocellus between 10th dorsal spine and 2nd or 3rd soft ray; anal and pelvic fins mostly dark brown to blackish; caudal dusky to translucent; pectorals pale with dark spot on upper portion of fin base and frequently on lower corner also. The ocellus and pale bars gradually fade with growth. The ocellus generally disappears before a standard length of 100 mm is obtained and the bars are usually lost between about 110-140 mm SL. In subadults which still exhibit bars the ocellus is sometimes replaced by a whitish blotch.

The colour of live individuals is similar to preserved material except the bars are brighter (whitish), the fins of juveniles are frequently yellowish, and the black ocellus is rimmed with pale blue. In addition, adults observed at Lord Howe Island were usually yellowish on the upper portion of the head. Mature individuals taken at Byron Bay, northern New South Wales had a white band behind the head which disappears rapidly after death.

#### Remarks

The holotype is deposited at the British Museum (Natural History).

#### Material examined

Sixty five specimens, 31.8-170.5 mm SL.

New Caledonia — AM I.17465-001, 83.0 mm, Noumea.

Norfolk Island — AM I.1400-01, 2 specimens, 83.0-86.0 mm; AM I.5419, 131.0 mm; AM I.6006, 112.0 mm.

Lord Howe Island — AM I.10656-58, 3 specimens, 38.2-120.5 mm; AM I.17368-042, 36 specimens, 34.5-159.3 mm.

Queensland — AM I.15620-033, 5 specimens, 140.0-165.3 mm, One Tree Island, Capricorn Group (plus 8 additional lots from this locality containing 12 specimens, 67.0-164.5 mm).

New South Wales — AM IB.7520, 170.5 mm, Southwest Rocks (south of Forster); AM I.15646-003, 67.0 mm, Long Bay (Sydney); AM I.15892-004, 124.0 mm, Long Reef (Sydney); AM I.16250-016, 31.8 mm, Seal Rock.

#### *Parma alboscapularis*, new species

(Figs. 1G, 2G, 13 and 14; Tables 1, 2 3 and 5)

*Parma microlepis* Whitley, 1968. Aust. Zool. 15(1), p. 64.

*Parma microlepis* (non Günther) Doak, 1972. Fishes of the New Zealand Region, p. 58, plates 24-25.



Fig. 13. *Parma alboscapularis*, holotype, 212 mm SL, Lord Howe Island.

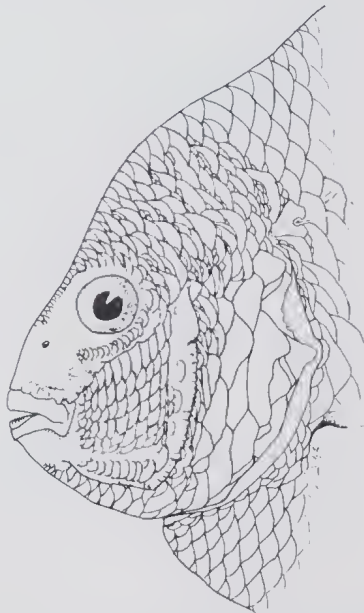


Fig. 14. Head of *Parma alboscapularis*.

## Holotype

AM I.17361-008, 212.0 mm, collected with spear off Erskine Valley Stream, Lord Howe Island in 8 metres by W. Starck II on 6 February 1973.

## Paratypes

Lord Howe Island: AM I.17360-023, 182.3 mm, collected with spear off Phillip Point, in 15-20 metres by G. Allen on 7 February 1973; AM I.17393-009, 200.0 mm, collected with spear off Phillip Point, in 8-10 metres by B. Russell on 8 February 1973; AM I.17411-010, 194.0 mm, collected with spear at Ball's Pyramid, in 10-15 metres by D. Hoese on 22 February 1973; New Zealand: NMNZ 3755, 2 specimens, 34.0 and 37.4 mm, collected at Mahia Peninsula, North Island, by A. Dobbins on 4 March 1964; NMNZ 4097, 80.8 mm, collected at Mayor Island in the Bay of Plenty, North Island, on 17 March 1965; NMNZ 5272, 84.8 mm, collected at the Poor Knights Islands, North Island, by C. Woudenburg on 5 November 1970; Kermadec: Island: CM 755, 158.0 mm, collected at Raoul Island, by J.H. Sorensen on 27 June 1944.

## Description

Dorsal rays XIII,18 (XIII,18½ to 20); anal rays II,15 (II,14½ to 16½); pectoral rays 21 (21 to 22); pelvic rays I,5; branched caudal rays 13; gill rakers on first arch 9 + 1 + 10 (9 to 13 + 1 + 10 or 11, total 19 to 25); tubed lateral-line scales 25 (28 to 31); vertical scale rows from upper edge of gill opening to base of caudal fin 36 (39 to 41); horizontal scale rows from base of dorsal fin to terminal lateral-line scale (exclusive of dorsal base sheath scales) 3 to 4; from lateral-line to anal fin origin 15 (15 to 16); teeth elongate and narrow with conical to nearly pointed tips, about 54 to 60 in a single row in each jaw of adults.

Body ovate, laterally compressed, the greatest depth 1.6 (1.6 to 1.7) in the standard length. Head profile rounded, the head length contained 3.4 (3.1 to 3.4) times in the standard length; snout 2.3 (2.6 to 3.4), eye 4.6 (3.3 to 4.5); interorbital 2.3 (2.6 to 3.3), least depth of caudal peduncle 1.7 (1.7 to 1.9), length of caudal peduncle 3.4 (3.1 to 4.3), of pectoral fin 0.9 (0.9 to 1.0), of pelvic fin 0.9 (0.8 to 0.9), caudal concavity 1.4 (1.4 to 1.9), all in head length.

Pair of small nasal openings on each side of snout, the posterior set nearly inconspicuous; mouth oblique, terminally located; lateral-line gently arched 3 to 5 scale rows beneath dorsal fin, terminating below anterior section of soft dorsal fin; preorbital with bony ridges on anterior and posterior corner, a few scales posteriorly; suborbital scaly; snout, lips, chin, and isthmus naked; remainder of head and body scaled; scales finely ctenoid; predorsal scales extending to about level of nostrils; preopercle scale rows about 6-7 with 2-3 additional rows of scales (may be embedded) on inferior limb; small sheath

scales covering basal half of membranous portion of spinous dorsal fin and most of soft dorsal, anal, pectoral, and caudal fins; margin of preorbital and suborbital smooth or crenulate except where interrupted by bony ridges; margin of preopercle crenulate; margin of opercle smooth except large flattened spine at angle and one or more lesser projections on upper edge.

Origin of dorsal fin at level of third tubed lateral-line scale; spines of dorsal fin gradually increasing in length to about sixth or seventh spine, remaining spines gradually decreasing in length; length of first dorsal spine 4.2 (3.1 to 4.4), of sixth dorsal spine 2.0 (1.9 to 2.1), of last dorsal spine 2.6 (2.3 to 2.4), of longest soft dorsal ray 1.3 (1.1 to 1.3), of first anal spine 5.6 (4.3 to 5.0), of second anal spine 2.3 (1.9 to 2.2), of longest soft anal ray 1.5 (1.2 to 1.5), all in the head length; caudal fin forked with rounded lobes; pectoral fins pointed.

Colour of holotype in alcohol: head and body entirely dark brown, except light brown on breast and abdomen; fins dark brown to blackish.

The adult paratypes are similarly coloured. Two juvenile paratypes, 34.0 and 37.4 mm are generally light brown (darker above the lateral-line) and exhibit the following features: small, scattered dark specks on body, most prominent just below lateral-line and also above anal fin base; a pair of dark lines on head and anterior portion of back, the first from snout tip to dorsal origin, the second from eye to dorsal ocellus (broken and indistinct posteriorly); dark streak below eye extending across suborbital to level of rictus; dark spot on side of snout in front of eye; spinous dorsal dusky, soft dorsal translucent; large black spot between 10th dorsal spine and 2nd soft dorsal ray; anal fin mostly translucent except spinous portion dusky; pelvics dark brown; pectorals and caudal translucent.

The juvenile pattern gradually fades with growth into the somber colour of adults. The 80.0 mm paratype is dark brown on the dorsal half and lighter below with scattered dark spots on the head and sides. The fins are dark brown to blackish except the soft dorsal, caudal, and pectorals which are dusky. The 84.8 mm paratype is similar except it lacks the dark spots. Instead there is a dark streak across each scale giving the appearance of many longitudinal lines on the sides.

Colour in life: Doak (1972) provided excellent colour photographs of the adult and juvenile stages. Adults are entirely dark brown grading to black on the fins. Sometimes there is a white patch on the suprascapular region (see comments below under remarks). Juveniles are generally yellow-orange with many brilliant blue spots covering the head and body. Blue lines extend from the snout to the anterior part of the back and the spinous portions of the dorsal, anal, and pelvic fins have narrow blue margins. A prominent black ocellus is present at the soft dorsal junction.

## Remarks

The bony ridges on the preopercle are not developed in the four smallest paratypes. In addition, these specimens have a smooth preopercular margin instead of the crenulate condition displayed by adults.

Doak (1972) reported that this species is common at certain localities off North Island, New Zealand. He further stated that spawning is generally restricted to the period between November and January. The eggs are attached to the algal carpet which covers the vertical surface of large boulders or rocky crevices. The male guards the nest during incubation and shows a marked increase in territorial behaviour during this period, which lasts less than 10 days. The diet consists mainly of algae.

Known only from Lord Howe Island, New Zealand, and the Kermadec Islands.

This species is named *alboscapularis* with reference to the white shoulder patch which is seen on live adults. The spot is 'turned' on or off according to behavioural 'moods'. It is generally flashed while driving intruders away from their territory and is particularly apparent in males during nest guarding activities.

### *Parma occidentalis*, new species

(Figs. 1E, 2F, 15 and 16; Tables 1, 2 3 and 4)

## Holotype

WAM P.10883, 106.9 mm, collected at Nancy Cove, Rottnest Island, Western Australia by A.R. Main and N. Milward on 24 January 1955.

## Paratypes

(All specimens from Western Australia) — WAM P.10988, 42.2 mm, collected at the Blowholes, 70 km north of Carnarvon by E. Car in May, 1962; WAM P.13743, 97.0 mm, collected at Rat Island, Abrolhos Group by R. McKay in March, 1963; WAM P.10940, 96.0 mm, collected at Wallaby Island, Abrolhos Group by anonymous collector in May, 1959; WAM P.10877, 93.3 mm, collected at Rottnest Island by N. Milward in 1958; WAM P.10882, 110.0 mm, same data as holotype except collected by N. Milward on 24 November 1955; WAM P.24817, 2 specimens, 73.8 and 94.5 mm, collected at Armstrong Point, Rottnest Island by University W.A. Zoology class on 11 March 1964; CSIRO C.2684-91, 8 specimens, 74.1-113.6 mm, Rottnest Island; CSIRO A.1491-99, 9 specimens, 38.0-52.8 mm, Rottnest Island; CSIRO A.1508-11, 4 specimens, 46.4-74.0 mm, Rottnest Island.

## Description

Dorsal rays XIII,18 (XIII,18½ to 21); anal rays II,16 (II,13½ to 15);

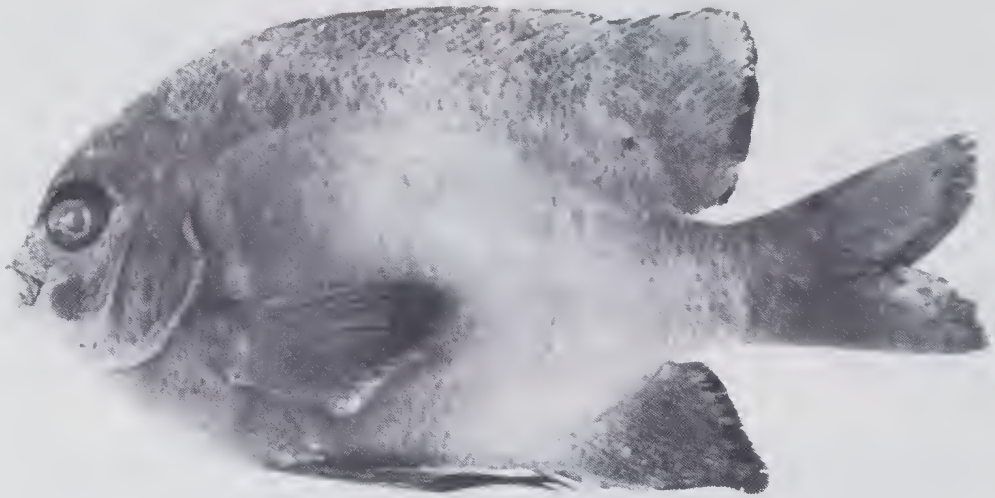


Fig. 15. *Parma occidentalis*, 106.9 mm SL, holotype, Rottneest Island.

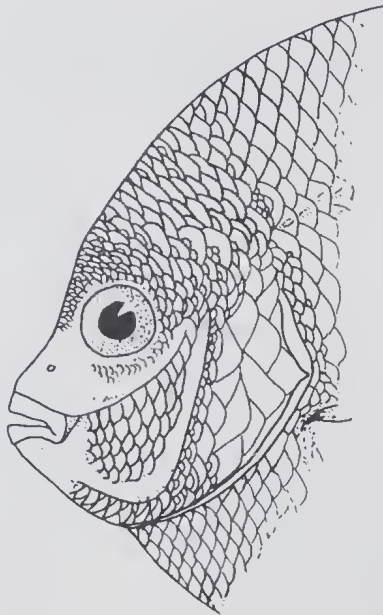


Fig. 16. Head of *Parma occidentalis*.

pectoral rays 21 (20 to 22); pelvic rays I,5; branched caudal rays 13; gill rakers on first arch 11 + 1 + 10 (9 to 11 + 1 + 9 to 10, total 19 to 22); tubed



lateral-line scales 34 (32 to 35); vertical scale rows from upper edge of gill opening to base of caudal fin 46 (43 to 46); horizontal scale rows from base of dorsal fin to terminal lateral-line scale (exclusive of dorsal base sheath scale) 4; from lateral-line to anal fin origin 19 (18 to 19); teeth elongate narrow, somewhat spatulate with rounded tips, about 46 to 50 in a single row in each jaw of adults.

Body ovate, laterally compressed, the greatest depth 1.7 (1.6 to 2.0) in standard length. Head profile slightly pointed, the head length contained 3.2 (3.0 to 3.4) in standard length; snout 2.9 (2.9 to 3.2), eye 3.2 (3.0 to 3.5), interorbital 3.1 (2.9 to 3.4), depth of caudal peduncle 1.9 (1.8 to 2.0), length of caudal peduncle 5.2 (3.5 to 5.3), of pectoral fin 1.0 (0.9 to 1.0), of pelvic fin 0.8 (0.7 to 0.9), caudal concavity 3.4 (2.0 to 3.1), all in head length.

Pair of small nasal openings on each side of snout, the posterior set nearly inconspicuous; mouth oblique, terminally located; lateral-line gently arched 4-6 scale rows beneath dorsal fin, terminating below anterior section of soft dorsal fin; suborbital and posterior section of preorbital scaly; snout, lips, chin, and isthmus naked; remainder of head and body scaled; scales finely ctenoid; predorsal scales extending to about front of orbits; preopercle scale rows about 6-7 with scattered scales on inferior limb; small sheath scales covering basal 2/3 of membranous portion of spinous dorsal fin and most of soft dorsal, anal, and caudal fins; margin of preorbital, suborbital, and bones of opercular series smooth except large flattened spine at angle of opercle.

Origin of dorsal fin at level of third tubed lateral-line scale; spines of dorsal fin gradually increasing in length to about sixth spine, remaining spines about equal in length; length of first dorsal spine 2.6 (2.7 to 3.0), of sixth dorsal spine 2.0 (1.8 to 2.2), of last dorsal spine 2.0 (1.9 to 2.5), of longest soft dorsal ray 1.5 (1.3 to 1.5), of first anal spine 4.5 (4.1 to 5.3), of second anal spine 1.7 (1.6 to 1.8), of longest soft anal ray 1.2 (1.1 to 1.3), all in head length; caudal fin forked with rounded lobes; pectoral fins pointed.

Colour of holotype in alcohol: uniform brown, darker on forehead and fins. Many paratypes with pair of faint dusky bands (about 2-3 scales wide) on sides, the first below dorsal spines 3 and 4, the second below dorsal spines 10 and 11, bands extending from dorsal base to lower portion of sides, barely detectable in some specimens. The following description of the juvenile pattern is based on 11 specimens, 38.0-56.0 mm SL: head and body mostly pale brown or tannish; head covered with numerous small dark spots, particularly apparent on snout and interorbital, and more conspicuous on smaller specimens; spinous dorsal tan to brown with narrow dark margin; irregular-shaped dark spot between about 12th dorsal spine and third soft ray (very faint in two specimens 47.5 and 52.0 mm and absent on a 46.0 mm specimen); soft dorsal brown, sometimes darker basally; pelvics and anal fin dark brown to dusky; pectorals pale; caudal brown at least on basal half; some specimens with posterior portion of soft dorsal and caudal fins more or less translucent.

Colour in life (from ektachrome transparencies provided by J. Butler): adults mostly greenish-brown, darker on fins; leading edge of pelvic and pectoral fins blue; iris blue. Adults which are almost entirely black are frequently encountered. The live colours of a 62.0 mm juvenile collected off Carnac Island (near Fremantle) Western Australia were as follows: head and body brown, golden brown on anterior two-thirds and darker brown posteriorly; head with many small blue dots, concentrated on suborbital, border of preopercle, interorbital, and nape: two narrow white bars on side below spinous dorsal fin extending from base of fin to lower portion of side; caudal peduncle with diffuse light grey bar; spinous dorsal fin golden brown with remnant of large blue ocellus posteriorly; soft dorsal, anal, and caudal fins dark brown; pelvic fins blackish.

#### Remarks

This species is sympatric with *P. mccullochi* along the south-western coast of Australia. It is easily distinguished from that species by the forehead profile (Fig. 1), different juvenile colour pattern (Fig. 2), and a higher lateral-line count.

This species is frequently encountered around islands off the metropolitan Perth area, including Rottnest, Carnac, and Garden Islands. At these localities it frequents rocky reefs generally at depths between two and six metres.

This species is named *occidentalis* in reference to its geographic distribution.

#### *Parma mccullochi*

(Figs. 2H, 17 and 18; Tables 1, 2 and 3)

*Parma mccullochi* Whitley, 1929a. Mem. Queensland Mus., vol. 9 (part 3), p. 228 (type locality, Rottnest Island, Western Australia).

*Parma microlepis* (non Günther) Waite, 1905 (in part, specimens from Houtman's Abrolhos). Rec. Aust. Mus., vol. 6, p. 69.

#### Diagnosis

Dorsal rays XIII, 18 to 19½; anal rays II, 14 to 15½; pectoral rays 20 to 21; tubed lateral-line scales 27 to 32; gill rakers 8 to 11 + 1 + 10 to 12; upper and lower jaw each with 52 to 62 teeth; body depth 1.7 to 1.9 in standard length; head length 3.1 to 3.4 in standard length; snout 2.7 to 3.0, eye 3.3 to 4.3, interorbital 2.6 to 3.0, depth of caudal peduncle 1.7 to 1.9, length of caudal peduncle 3.2 to 4.1, of pectoral fin 0.9 to 1.1, of pelvic fin 0.9 to 1.1, caudal concavity 1.5 to 1.7, all in head length.

Colour in alcohol: adults entirely dark brown, slightly lighter on breast and abdomen. Juveniles under about 40-50 mm SL display the following pattern: body mostly tan or light brown with dark stripes extending from

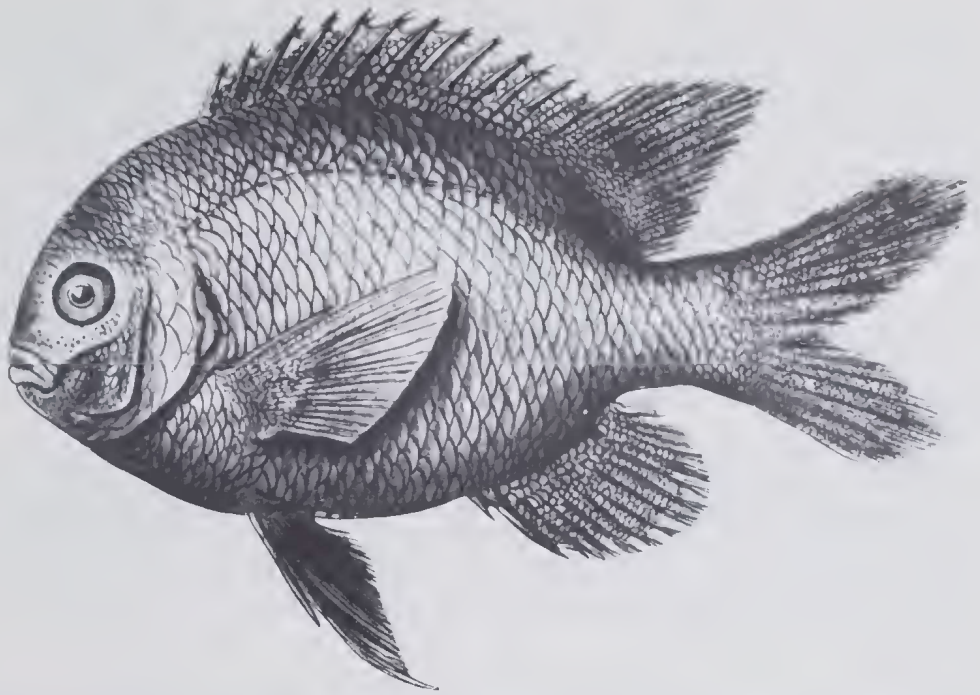


Fig. 17. *Parma mccullochi*, holotype, Rottneest Island, Western Australia (from Whitley, 1922b).

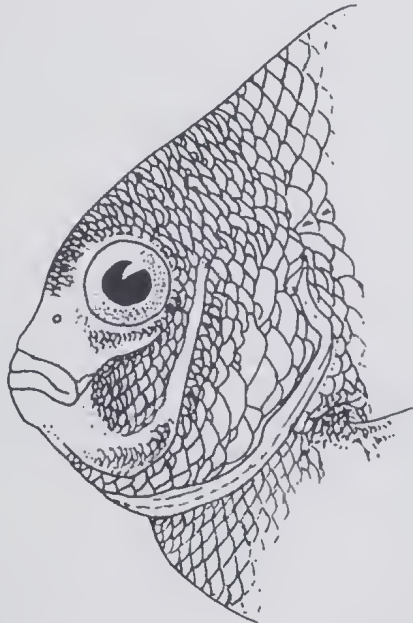


Fig. 18. Head of *Parma mccullochi*.

snout to dorsal origin and from upper edge of eye to below soft dorsal junction, two other lines interspersed between these stripes, but stopping short of head region; about 30-40 dark brown spots scattered on sides, about 5-6 similar spots on lower corner of opercle and broken dark line just below eye; pale-rimmed, black ocellus at soft dorsal junction; spinous dorsal brown basally, pale on distal portion with narrow dark margin; soft dorsal, anal, pelvic, and caudal fins tan to transparent. At a size of approximately 50-60 mm SL the transformation to the adult pattern is initiated. The general body colour gradually darkens and the spots, stripes, and ocellus begin to fade; 80 mm SL specimens are generally dark, although they clearly retain the juvenile pattern, except the dorsal ocellus may be absent or very faded. The last juvenile characters retained are the spots on the head and broken line below the eye. These features may persist until a size of about 110-120 mm SL.

Colour in life (from ektachrome transparencies provided by J. Butler): adults mostly dark greenish-brown; anterior part of head slightly yellowish; narrow blue margin on leading edge of pelvic, anal, and pectoral fins; iris orange. Small juveniles are mainly bright yellow with a pattern of blue spots and stripes, and a blue-ringed black ocellus on the dorsal fin.

#### Remarks

This species has generally been referred to as *Actinochromis victoriae* by Perth divers and aquarists. It is the common shallow water *Parma* of southern Western Australia. Off the Perth metropolitan area it is encountered in the vicinity of rocky reefs, particularly those surrounding offshore islands. It is particularly common at Rottnest Island, at depths from two to at least 25 metres.

The holotype is deposited at the Australian Museum.

#### Material examined

Twenty specimens, 22.2-192.7 mm SL.

Western Australia (from Rottnest Island unless indicated otherwise) — AM I.13144 (holotype), 109.5 mm; WAM P4096, 133.0 mm, Lancelin Island; WAM P4184, 192.7 mm, Lancelin Island; WAM P4733, 158.0 mm, Abrolhos Group; WAM P10783-91, 9 specimens, 22.2-142.0 mm; WAM P10857, 79.5 mm; WAM P22306, 162.3 mm, Burn's Beach, near Perth; WAM P24816, 3 specimens, 87.2-146.3 mm; WAM P24854, 44.0 mm, Albany; WAM P24856, 42.0 mm, Albany.

Table 1. Fin ray counts for species of *Parma*

species	soft dorsal rays							soft anal rays							pectoral rays										
	16	16½	17	17½	18	18½	19	19½	20	20½	21	13	13½	14	14½	15	15½	16	16½	19	20	21	22		
<i>alboscupularis</i>					2	3	1	2	1					2	6			1					2	7	
<i>miculochi</i>					1	10	4	2					4	8	6	2							1	19	
<i>microlepis</i>	1	1	2	10	4	2							3	2	12	2	1						4	16	
<i>occidentalis</i>					1	1	1	10	2	7	2	1	2	15	5	1							6	16	3
<i>obigolepis</i>			2		2	2	4	4	1			1	1	9	4								6	8	1
<i>polylepis</i>	1		2	2	13	2						1	1	18								1	14	5	
<i>unifasciatus</i>	1		2	10	1	6	1					5	13	3								4	14	3	
<i>victoriae</i>	1	3	3	2										6	2	1						1	7	1	

Table 2. Lateral line scale counts for species of *Parma*

species	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
<i>alboscupularis</i>					1		1	3		3	1				
<i>miculochi</i>							3	2	5	2	5	3			
<i>microlepis</i>			2	4	4	4	5	1							
<i>occidentalis</i>											1	1	9	8	2
<i>obigolepis</i>		3	6	4											
<i>polylepis</i>						3			5	4		2	1		
<i>unifasciatus</i>		1	1	3	9	6	1								
<i>victoriae</i>	7	2													

Table 3. Gill raker counts for species of *Parma*.

species	Upper Limb							Angle	Lower Limb				
	7	8	9	10	11	12	13		1	8	9	10	11
<i>alboscapularis</i>			3	3	1		1	8		1	1		6
<i>mccullochi</i>	3	8	2					20			11	7	2
<i>microlepis</i>	4	3	12	1				20			7	13	
<i>occidentalis</i>		6	16	2				24		20	4	1	
<i>oligolepis</i>		1	6	2	2			11				9	2
<i>polylepis</i>	2	2	5	8	3			20		7	10	3	
<i>unifasciatus</i>		2	10	6	1			19			3	13	3
<i>victoriae</i>			3	5	1						3	6	

Table 4. Morphometric proportions of selected type specimens of *Parma occidentalis* n. sp. (expressed in thousandths of the standard length)

Character	Holotype		Paratype		Paratype		Paratype		Paratype	
	WAM	P10883	WAM	P24817	WAM	P24817	WAM	P10882	WAM	P10940
Standard length (mm)	106.9		94.5		73.8		110.0		42.2	96.0
Body depth	578		534		539		610		507	589
Body width	217		212		191		227		178	227
Head length	316		301		318		331		332	332

Table 4 (Contd)

Snout length	109	102	102	114	78	104
Eye diameter	99	101	104	100	140	98
Interorbital width	102	102	93	115	76	99
Least depth of caudal peduncle	165	164	163	182	159	172
Length of caudal peduncle	61	74	73	73	69	63
Snout to origin of dorsal fin	449	432	420	462	440	424
Snout to origin of anal fin	726	730	718	727	730	743
Snout to origin of pelvic fin	452	468	443	436	462	452
Length of dorsal fin base	664	650	653	709	626	677
Length of anal fin base	234	238	241	245	237	240
Length of pectoral fin	332	298	322	353	424	305
Length of pelvic fin	421	419	377	473	367	375
Length of pelvic spine	215	212	203	236	213	208
Length of 1st dorsal spine	120	106	108	121	111	125
Length of 6th dorsal spine	155	165	169	168	190	153
Length of last dorsal spine	159	159	171	165	173	135
Length of longest soft dorsal ray	217	238	221	261	225	245
Length of 1st anal spine	70	73	75	77	59	63
Length of 2nd anal spine	187	180	205	197	180	181
Length of longest anal ray	260	268	257	273	220	248
Length of longest caudal ray	290	307	325	348	313	289
Length of middle caudal ray	196	180	165	218	213	182
Caudal concavity*	94	127	160	130	100	106

\* horizontal distance between longest and shortest caudal rays.

Table 5. Morphometric proportions of selected, type specimens of *Parma alboscapularis* n. sp.

(expressed in thousandths of the standard length)

Character	Holotype AM I.17361-008	Paratype AM I.17411-010	Paratype AM I.17393-009	Paratype AM I.17360-023	Paratype NMNZ 4097	Paratype NMNZ 3755
Standard length (mm)	212.0	194.0	200.0	182.3	80.8	37.4
Body depth	625	585	575	601	582	487
Body width	235	245	230	225	223	195
Head length	290	294	293	302	322	361
Snout length	125	106	109	118	95	99
Eye diameter	63	69	67	67	99	134
Interorbital width	125	110	113	123	97	88
Least depth of caudal peduncle	172	165	168	170	171	139
Length of caudal peduncle	86	94	90	88	74	70
Snout to origin of dorsal fin	442	433	415	433	411	406
Snout to origin of anal fin	746	716	730	721	699	679
Snout to origin of pelvic fin	423	388	433	384	402	428
Length of dorsal fin base	652	624	633	686	644	588
Length of anal fin base	241	228	225	255	262	227
Length of pectoral fin	311	314	307	318	349	294
Length of pelvic fin	330	326	317	320	386	342
Length of pelvic spine	189	170	165	172	186	166
Length of 1st dorsal spine	68	67	70	73	105	80
Length of 6th dorsal spine	149	152	138	148	161	174
Length of last dorsal spine	112	124	125	123	136	107
Length of longest soft dorsal ray	226	245	238	241	297	209
Length of 1st anal spine	52	59	63	66	74	67
Length of 2nd anal spine	127	134	142	151	173	174
Length of longest anal ray	190	219	192	219	278	227
Length of longest caudal ray	319	322	313	326	359	320
Length of middle caudal ray	118	118	130	132	186	187
Caudal concavity*	201	205	183	195	173	134

\* horizontal distance between longest and shortest caudal rays



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